REPORT

25800 COMMERCENTRE DRIVE, LAKE FOREST, CA 92630

Project No. G101930166 Date: December 15, 2014

REPORT NO. 101930166LAX-006

TEST OF ONE HID REPLACEMENT LAMP

MODEL NO. DEG-150175
LED MODEL NO. CREE XM-L2
DRIVER MODEL NO. DEG-50W

RENDERED TO

DIFFERENTIAL ENERGY GLOBAL LIMITED
1540 LEADER INTERNATIONAL DRIVE
PORT ORCHARD, WA, 98367

TEST: Electrical and Photometric tests as required to the IESNA test standard and In-Situ test.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number 500568619.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

Energy Star Manufacturer's Guide Version 2.1 (2010): Guide for Qualifying Solid State Lighting Luminaires

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number DEG-150175. The sample was received by Intertek on December 9, 2014, in undamaged condition and one sample was tested as received. The sample designation was LAN14120881317-006.

DATES OF TESTS: December 11, 2014 through December 15, 2014.

SUMMARY

Model No.:	DEG-150175
Description:	HID Replacement Lamp

	Result	
Criteria	Sphere	Goniometer
Total Lumen Output (Lumens)	4585	4553
Total Power (W)	58.60	58.00
Luminaire Efficacy (LPW)	78.24	78.5

Criteria	Result
Power Factor at 119.99Vac	0.927
Power Factor at 277.01Vac	0.860
Current ATHD % at 119.99Vac	20.65
Current ATHD % at 277.01Vac	32.53
Correlated Color Temperature (CCT - K)	4512
Color Rendering Index (CRI - Ra)	76.0
Color Rendering Index (CRI - R9)	-9.0
DUV	0.001
Chromaticity Coordinate (x)	0.361
Chromaticity Coordinate (y)	0.366
Chromaticity Coordinate (u')	0.216
Chromaticity Coordinate (v')	0.494
Maximum In-Situ Source Temperature Point (°C)	45.7

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Date Calibrated	Calibration Due Date
LabSphere Power Supply	LPS-100-0833	000832	05/20/14	05/20/15
LapSphere 3M Integrating Sphere	CA-11821-LRT	000830	VBU	VBU
LabSphere Spectrometer	CDS-3020	000834	VBU	VBU
California Instruments Power Supply	CSW5550	001339	VBU	VBU
Yokogawa Power Meter	WT333	001319	05/15/14	05/15/15
Temperature Humidity Meter	971	001181	04/03/14	04/03/15
Extech Instruments Stop Watch	C-510	000351	09/25/14	09/25/15
LSI High Speed Mirror Goniometer	6440T	000943	12/03/14	01/03/15
Elgar Power Supply	CW1251	000944	VBU	VBU
Yokogawa Power Analyzer	WT210	000945	11/14/14	11/14/15
Temperature Humidity Meter	971	001181	04/03/14	04/03/15
Extech Instruments Stop Watch	C-510	000351	09/25/14	09/25/15
Tape Measure	33-428	001120	12/28/13	12/28/14
DMM	87	29	11/07/14	11/07/15
Power Supply (AC 3P / DC)	LAN	1338	06/09/14	06/09/15
Stop Watch	C-510	351	09/25/14	09/25/15

TEST METHODS

Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere CDS 3020 Spectrometer and Three Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The calibration of the sphere spectrometer system is traceable to the National Institute of Standards and Technology.

Photometric and Electrical Measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

In-Situ Maximum Measured Power Supply Case and LED Source Point Temperature

Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source temperature measurements were measured at the TMPPS or TS point as indicated by the included diagram in accordance with manufacturers declared hot spot location, or at a hot spot location found with a thermal camera when no diagram from the manufacturer is given. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598 or UL 153 as applicable.

RESULTS OF TEST

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) - Integrating Sphere Method

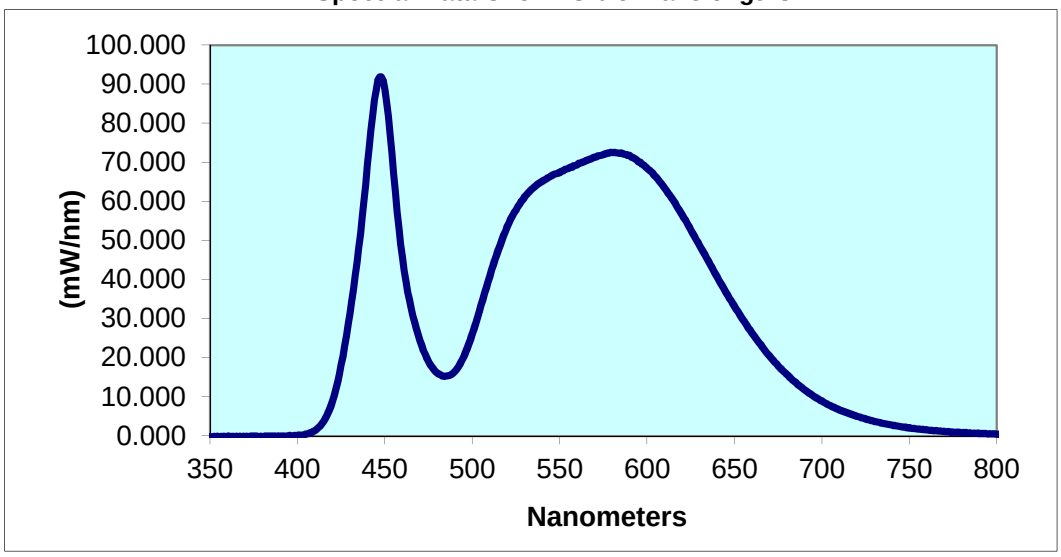
Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (LPW)
LAN14120881317-006	SIDE	120.0	527.0	58.60	0.927	20.65	4585	78.24
		277.0	305.0	72.80	0.860	32.53		

Correlated Color Temperature (K)	CRI -Ra	CRI -R9	DUV	CIE 31' Chromaticity Coordinate	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
4512	76.0	-9.0	0.001	0.361	0.366	0.216	0.494

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	-0.114	440	69.270	530	61.260	620	56.530	710	6.677
355	-0.272	445	88.580	535	63.480	625	52.710	715	5.787
360	-0.039	450	88.660	540	65.230	630	48.740	720	5.032
365	-0.073	455	67.270	545	66.530	635	44.740	725	4.356
370	-0.143	460	45.620	550	67.460	640	40.760	730	3.730
375	-0.085	465	32.670	555	68.490	645	36.770	735	3.217
380	-0.114	470	24.530	560	69.420	650	33.060	740	2.770
385	-0.085	475	18.960	565	70.440	655	29.570	745	2.378
390	-0.072	480	16.100	570	71.380	660	26.310	750	2.061
395	0.067	485	15.330	575	72.020	665	23.250	755	1.772
400	0.168	490	16.530	580	72.470	670	20.410	760	1.543
405	0.468	495	20.190	585	72.450	675	17.890	765	1.319
410	1.437	500	26.150	590	71.730	680	15.720	770	1.128
415	3.800	505	33.470	595	70.140	685	13.660	775	0.982
420	8.897	510	40.900	600	68.480	690	11.820	780	0.842
425	18.160	515	47.740	605	66.240	695	10.220		
430	31.350	520	53.570	610	63.430	700	8.903		
435	48.110	525	57.830	615	60.270	705	7.734		

Spectral Data Over Visible Wavelengths



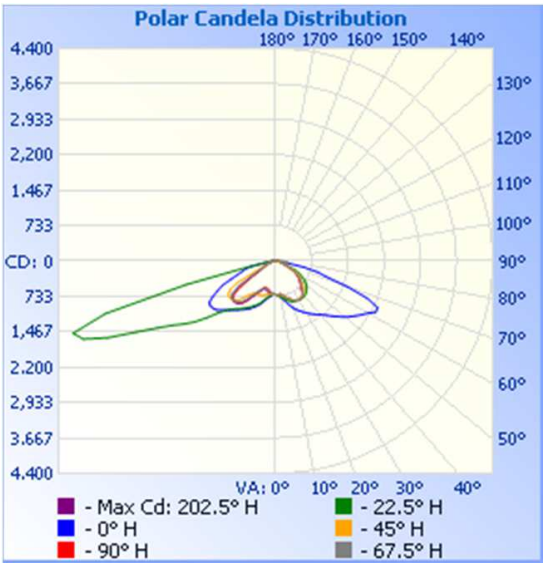
RESULTS OF TEST (cont'd)

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
LAN14120881317-006	SIDE	120.0	512.2	58.00	0.943	4553	78.5

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	690	690	690	690	690
5	718	722	714	704	697
10	792	778	704	707	709
15	906	832	759	779	779
20	1034	889	831	842	840
25	1137	913	893	902	892
30	1238	922	913	929	931
35	1344	935	917	906	922
40	1450	923	877	854	841
45	1610	880	803	740	718
50	1797	815	704	651	629
55	1977	724	606	569	544
60	2157	592	486	443	415
65	2281	425	313	274	239
70	1540	201	156	160	158
75	879	104	98	119	98
80	262	72	67	158	77
85	69	51	51	219	77
90	25	28	29	117	40

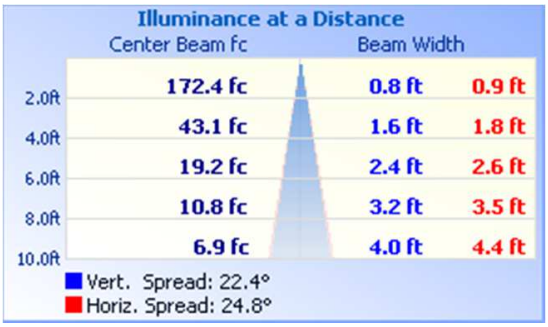


RESULTS OF TEST (cont'd)

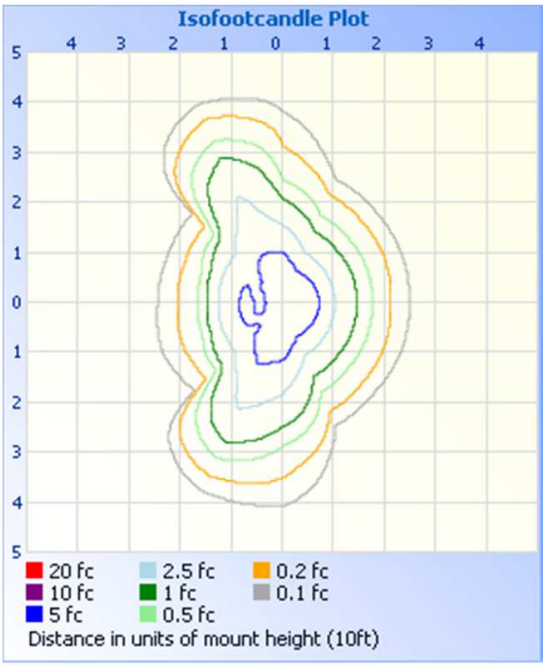
Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	695.0	15.3
0-40	1325	29.1
0-60	3133	68.8
60-90	1415	31.1
0-90	4548	99.9
90-180	5.8	0.1
0-180	4553	100.0

Zonal Lumens and Percentages at 25°C

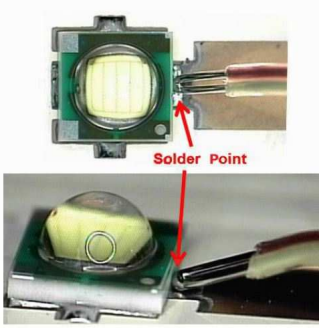
Zone	Lumens	% Luminaire
0-10	67.5	1.5
10-20	219.2	4.8
20-30	408.3	9.0
30-40	630.1	13.8
40-50	850.3	18.7
50-60	957.2	21.0
60-70	887.3	19.5
70-80	428.9	9.4
80-90	98.9	2.2
90-100	5.8	0.1

RESULTS OF TEST (cont'd)

In-Situ Maximum Measured LED Source Temperature

Manufacturer Supplied Documentation:

LED model identified as:



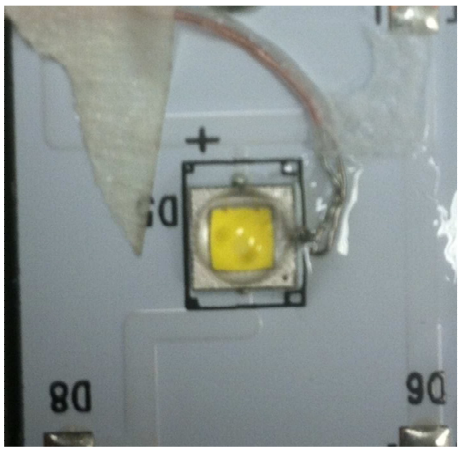
Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		2.5	
Forward voltage (@ 3000 mA, 85 °C)	V		3.3	
LED junction temperature	°C			150

Maximum Junction Temperature from LED specification (Tj) = 150°C
Thermal Resistance Formula from LED specification = 2.5°C/W
Maximum Forward Voltage (Vf) from LED specification = 3.3V
Measured LED Current = 1847mA
Calculated LED Wattage = Vf x Measured LED Current = 6.095W
Maximum Source Temperature (Ts) = Tj – (LED Wattage x Thermal Resistance) = 134.8°C

Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (°C)	Location	Maximum Rated Source Temperature (°C)
LAN14120881317-006	45.7	Per diagram	134.8

In-Situ Picture – Ts



In-Situ Picture – Ts location

PICTURE (not to scale)

CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Erik Linares
Technician
Lighting Division

Report Reviewed By:

Kenda Branch
Lighting Performance Team Lea
Lighting Division

Attachment: None